

2024/02/08

# Xe-Still Project

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Xe

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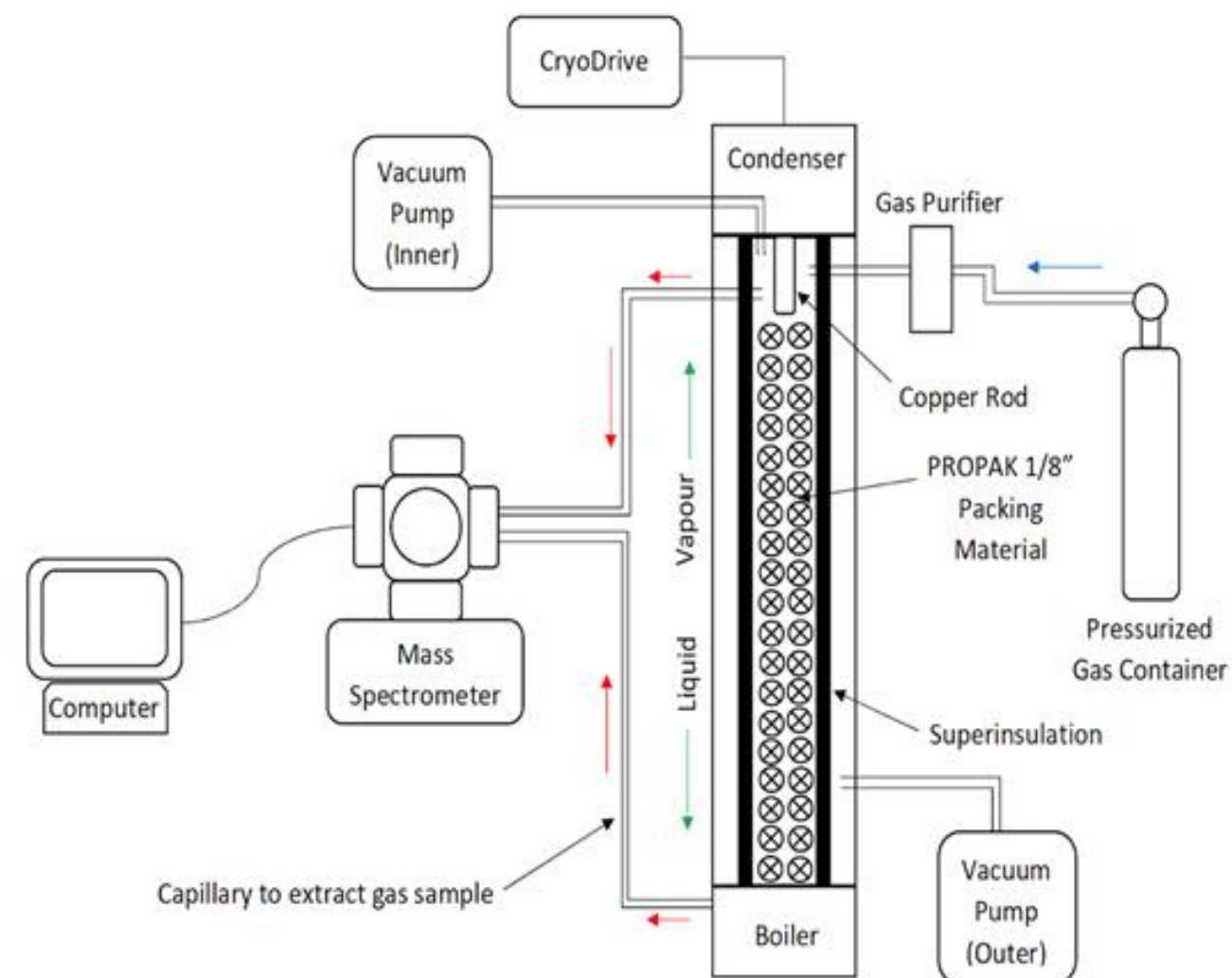
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# Experiment Overview

Goal: explore cryogenic distillation to enrich xenon in  $^{136}\text{Xe}$  for  $0\nu\beta\beta$  decay searches

- More specifically: measurement of isotopic dependence of vapour pressures



Procedure:

- cryogenic distillation runs with argon, krypton and xenon
- isotopic sampling of top-bottom over time (~months at SNOLAB)



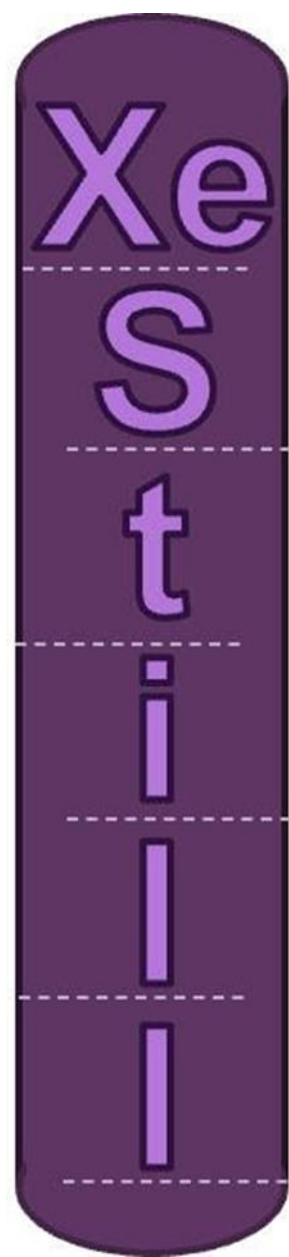
Carleton U.  
1.82m

Photo courtesy of A. Pocar



Cryopit (top)  
14.6m

Cryopit (bottom)



# New science developments

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The underlying objective of this study is xenon enrichment for neutrinoless double beta decay searches.

The field is working towards the next generation of experiments:

- probe the inverted ordering of neutrinos masses
- xenon at the tonne-scale
- nEXO 90%  $^{136}\text{Xe}$ , within few years by centrifugation method

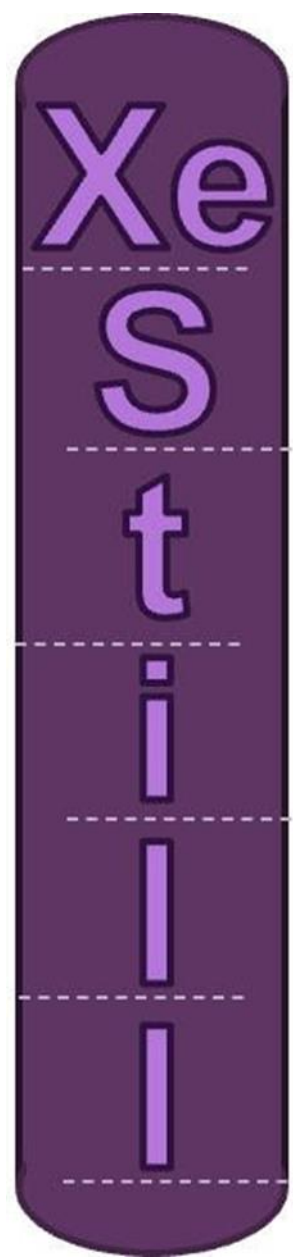
The community is already thinking ahead at the ktonne-scale:

- probe the normal ordering of masses, favored by oscillation experiments
- 1<sup>st</sup> workshop on this discussion took place at SLAC, October 23, invited for a talk
- feedback, think of a realistic-scale implementation

A secondary outcome of our measurements is data of Ar purification, useful for dark matter searches.

We now have two full Ar runs (+1 dry run) in several configurations, valuable results.





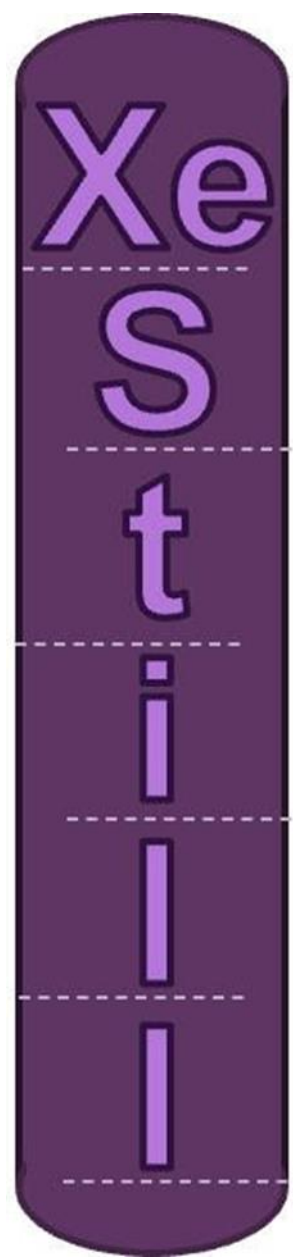
# Collaboration Health

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Our group welcomes members of any background.

It is a small group, overall total of 18 people / 5 currently active.

No policies or guidelines in place due to the short lifetime of the project, other than those already enforced by SNOLAB.



# Experiment Status (Since August 23)

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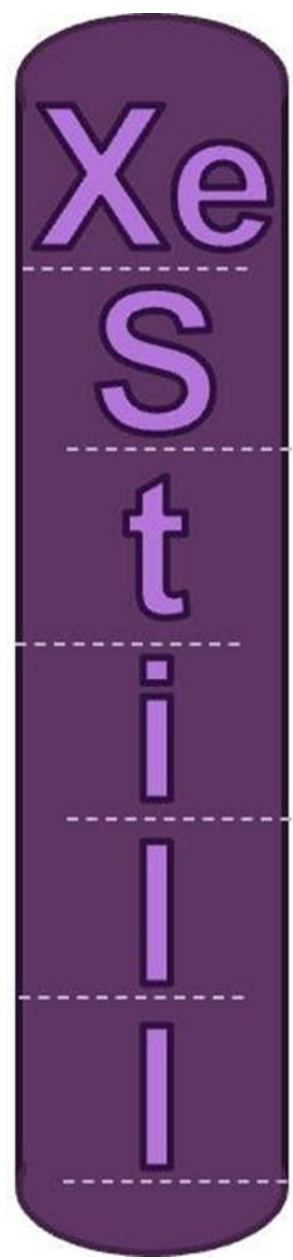
From previous talk's slide "What's Next?"

- ~~2<sup>nd</sup> argon run, testing and further measurements (+1 dry, useful for systematic studies)~~
- ~~Krypton run for validation (cut short again, but possibly sufficient for Xe measurements)~~
- Xenon run for measurements (halted due to operational maintenance and reduction in FTE)

Group members:

- Project leader Caio moved from scientist at SNOLAB to faculty position at UWindsor
- MSc student Bakr defended thesis on Ar calibration and moved to PhD in nEXO
- New MSc student Drake Wickman started classes in fall, will ramp up analysis efforts after
- Erica Caden left group, Steve Sekula is joining
- David Sinclair, Ashley Matthewson, Steffon Luoma continue contributions

We saw a significant decrease in FTEs, but we expect to recover soon

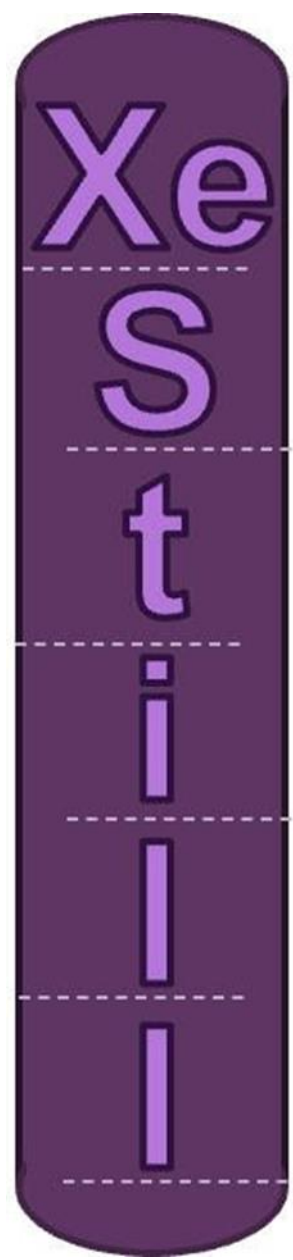


# Schedule impacts & milestones

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We are working towards completion of xenon run by end of summer

- Maintenance operations should be completed soon
- Another Kr run by end of winter
  - practice running the detector
  - cross-check of previous results
- Final Xe runs by end of spring or summer
  - technical procedures to recover xenon are being tested



# Challenges

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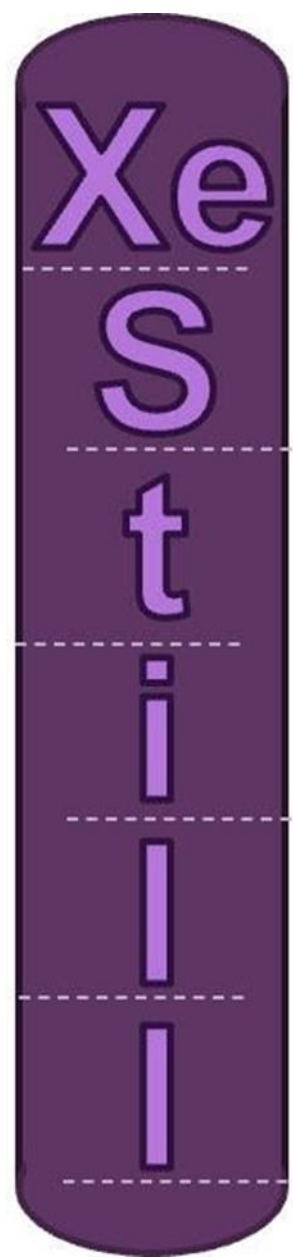
The main challenge to complete the program resides in:

- Run the detector stably with xenon for about 1-2 months

More specific aspects of this challenge in the upcoming months:

- Reduced FTE from project leader due to teaching until spring
- Reduced analysis capability due to student in training
- Making sure we are ready to recover xenon

Asked at Pre-EAC meeting: Not sure how SNOLAB can help with this other than providing the support that it has been offering (and patience)



# Conclusion – any other pertinent business

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We are a couple years late in completing the program but still up to make the first precise measurement of the xenon vapour pressures.

Looking forward to complete measurements!

Thank you